

CLAIMS

1 1. A control mechanism comprising:
 2 an optically transparent member;
 3 a knob, wherein the knob is rotatable by a user, the knob rotationally coupled to
 4 the optically transparent member;
 5 on the knob, a reflective surface;
 6 an optical light source for directing light toward the knob; and
 7 at least one optical receiver, wherein the at least one optical receiver detects light
 8 from the optical light source that is reflected toward the optical receiver by the reflective
 9 surface.

1 2. The control mechanism of claim 1 further comprising:
 2 a circuit, wherein the circuit converts the reflected light received by the at least
 3 one optical receiver into a control signal wherein upon rotation of the knob by a user,
 4 reflected light detected by the receiver is converted into a control signal.

1 3. The control mechanism of claim 1 wherein the circuit element comprises:
 2 a modulator for modulating the output light produced by the optical light source;
 3 and
 4 a demodulator, wherein the demodulator is configured to convert the modulated
 5 light into the control signal by demodulating the modulated light received by the at least
 6 one optical receiver from the light source.

1 4. The control mechanism of claim 1 wherein the reflective surface comprises bands
 2 of reflective surface and wherein the bands of reflective surface alternate with bands of
 3 non-reflective surface.

1 5. The control mechanism of claim 1, the control mechanism further comprising a
 2 first optical receiver and a second optical receiver wherein the direction of rotation of the
 3 knob is determined by comparing the outputs of the first and second optical receivers.

1 6. The control mechanism of claim 5, wherein:

2 when detection by the first optical receiver of light reflected from one band of
3 reflective surface is followed by detection by the second optical receiver of light reflected
4 from the one of the bands of the reflective surface, the circuit identifies a knob turn in a
5 first direction; and

6 when detection by the second optical receiver of light reflected from the one of
7 the bands of the reflective surface is followed by detection by the first optical receiver of
8 light reflected from the one of the bands of the reflective surface, the circuit identifies a
9 knob turn in a second direction.

1 7. The control mechanism of claim 6, wherein knob rotation is in a direction of the
2 shortest rotation between a position of the knob upon detection by the first optical
3 receiver of light reflected from one band of reflective surface and a position of the knob
4 upon detection by the second optical receiver of light reflected from the one of the bands
5 of the reflective surface.

1 8. The control mechanism of claim 1 further comprising:

2 a display, wherein the display is positioned in the area behind the optically
3 transparent member, the display viewable through the optically transparent member.

1 9. The control mechanism of claim 8 wherein the knob is constructed of transparent
2 material, wherein at least a portion of the display is positioned in an area behind the
3 optically transparent knob, the display being viewable through the knob.

1 10. The control mechanism of claim 9 wherein a knob surface area has a transmissive
2 material, the transmissive material being capable of projecting the portion of the display
3 positioned in the area behind the optically transparent knob on the knob surface area.

1 11. The control mechanism of claim 1 wherein the optical light source projects the
2 light transversely through the optically transparent member.

1 12. The control mechanism of claim 1 wherein the light directed by the optical light
2 source toward the knob is infrared light.

1 13. The control mechanism of claim 1 wherein the optically transparent member is
2 positioned between a source of ambient light and the at least one optical receiver and the
3 optical coating on the optically transparent member blocks transmission of ambient light
4 from an extraneous source to the at least one optical receiver over a predetermined range
5 of the electromagnetic spectrum.

1 14. The control mechanism of claim 13 wherein a surface area of the optically
2 transparent member is coated with an optical coating.

1 15. The control mechanism of claim 13 wherein the light directed toward the knob by
2 the optical light source is electromagnetic energy and wherein the optical coating on the
3 optically transparent member reduces the transmission of the electromagnetic energy in at
4 least a portion of the frequency range in which the at least one optical receiver operates.

1 16. The control mechanism of claim 15 wherein the optical coating on the optically
2 transparent member reduces the transmission of the electromagnetic energy in a
3 frequency range of the electromagnetic spectrum that is common to both the frequency
4 range of the optical light source and the frequency range that the at least one optical
5 receiver responds to.

1 17. The control mechanism of claim 13 wherein the optically transparent member
2 contains a dye such that the dye blocks transmission of light from extraneous sources of
3 light to the at least one optical receiver over a predetermined range of the electromagnetic
4 spectrum.

1 18. The control mechanism of claim 13 wherein the at least one optical receiver is
2 coated with an optical coating such that the optical coating on the at least one optical
3 receiver blocks transmission of ambient light from an extraneous source to the at least
4 one optical receiver.

1 19. The control mechanism of claim 1 wherein the optically transparent member is
2 constructed from one of polycarbonate material, acrylic, cyclic olephins, thermoset
3 material, and plastic.

1 20. The control mechanism of claim 1 wherein the optical source and at least one
2 optical receiver are positioned in locations relative to the optically transparent member so
3 as to permit transmission and reception of light transversely through the optically
4 transparent member.

1 21. The control mechanism of claim 1 wherein the control mechanism operates in a
2 motor vehicle.

1 22. The control mechanism of claim 1 wherein the control mechanism operates as the
2 control mechanism for a media player.

1 23. The control mechanism of claim 1 wherein the control mechanism operates as the
2 control mechanism for a portable device.

1 24. The control mechanism of claim 1 wherein, when the user presses the knob, the
2 knob transmits a force to the optically transparent member whereupon the optically
3 transparent member transmits a resulting force to a switch associated with a desired
4 control function.

1 25. The control mechanism of claim 1 further comprising:
2 one of a voice recognition, a motion detection and a proximity detector device
3 wherein the control mechanism accepts additional user input from the one of the voice
4 recognition device, the motion detection device and the proximity detection device.

1 26. The control mechanism of claim 1 further comprising a proximity detector
2 wherein the proximity detector detects the presence of a user's hand near the control
3 mechanism and wherein, upon placement of the user's hand near the control mechanism,
4 the control mechanism is configured to change information content of the display.

1 27. The control mechanism of claim 26 wherein the information content is a set of at
2 least one menu option.

1 28. The control mechanism of claim 26 wherein the proximity detector-based control
2 mechanism is configured to change the information content of a multi-media device
3 employed in a vehicle.

1 29. The control mechanism of claim 26 wherein the control mechanism, based upon
2 detection of the presence of a user's hand proximate to the control mechanism, increases
3 the information content displayed.

1 30. The control mechanism of claim 26 wherein the control mechanism, based upon
2 an absence of detection of the presence of a user's hand proximate to the control
3 mechanism, decreases the information content displayed.

1 31. The control mechanism of claim 26 wherein the proximity sensor further
2 comprises a transmitter and receiver and wherein, in addition to sensing a signal
3 indicating proximity of the user's hand to the control mechanism, the receiver detects a
4 signal transmitted by a remote control.

1 32. The control mechanism of claim 31 wherein, when the signal indicating proximity
2 of the user's hand and the signal transmitted by the remote control are modulated
3 according to different modulation schemes, the receiver distinguishes between the signal
4 indicating proximity of the user's hand and the signal transmitted by the remote control
5 by identifying one of the modulation and coding of both signals.

1 33. The control mechanism of claim 1 further comprising:
2 a friction sleeve wherein the friction sleeve is affixed to the circumference of the
3 knob thereby providing a friction surface, wherein the friction surface slides rotatably
4 within a holding mechanism for the knob.

1 34. The control mechanism of claim 26 wherein the friction sleeve is constructed of a
2 material having a low coefficient of friction.

1 35. The control mechanism of claim 33 wherein the material with a low coefficient of
2 friction is PTFE.

1 36. The control mechanism of claim 34 wherein the friction sleeve is in contact with
2 the optically transparent member, leaving a gap between the portion of the knob with
3 reflective surfaces and the optically transparent member.

1 37. The control mechanism of claim 1 further comprising:
2 a capture member wherein the capture member is attached to the circumference of
3 the knob and wherein the capture member applies a positioning pressure to the rear side
4 of the optically transparent member thereby holding the knob in a position relative to the
5 optically transparent member.

1 38. The control mechanism of claim 1 wherein at least one of the optical light source
2 and the at least one optical receiver is mounted on the optically transparent member.

1 39. A control mechanism comprising:
2 a transparent knob wherein the transparent knob is connected to the shaft of a
3 rotational combination control;
4 a display, wherein the display is positioned in the area behind the knob, the
5 display projects output that is viewable through knob; and
6 a circuit, wherein the circuit converts a user-applied force into a control signal
7 that is representative of the positional control location associated with an input selection
8 desired by the user.

1 40. The control mechanism of claim 39 wherein a spatial relationship exists between
2 a multiple of positional control locations of the knob and a multiple of user input options
3 wherein the rotational combination control accepts a transverse force vector resulting
4 from a direct force applied by the user to the knob at a distance from a center location of
5 the knob representative of a desired user input.

1 41. The control mechanism of claim 39 wherein the knob is rotatable by a user and
2 wherein, in response to rotation of the knob by the user, the control mechanism identifies
3 a control indication.

1 42. The control mechanism of claim 41 wherein, in response to the identification of a
2 control indication by the control mechanism, the control mechanism displays a set of user
3 input options, wherein individual input options are associated with rotational positions of
4 the knob.

1 43. The control mechanism of claim 42 wherein, the display is configured to display
2 the set of input options associated with the rotational positions of the knob, wherein the
3 input options are viewable by a user through the rotational pressure member.

1 44. A system for accepting user input, comprising:
2 a plurality of switches;
3 an optically transparent member coupled to the plurality of switches, the optically
4 transparent member having multiple sections, wherein each section of the multiple
5 sections is associated with a switch of the plurality of switches;

6 wherein the optically transparent member is positioned in relation to the plurality
7 of switches such that when a force is applied by a user to one of the multiple sections, the
8 pressure member transmits a resulting force to a switch associated with the one of the
9 multiple sections; and

10 wherein the switches of the plurality of switches detect the intensity of the force
11 applied by the user.

1 45. The system of claim 44 comprising:
2 a first switch of the plurality of switches;
3 a second switch of the plurality of switches;
4 a control circuit;

5 wherein, as a result of the exertion of a force by the user to the optically
6 transparent member, the optically transparent member transmits a first resulting force to a
7 first switch associated with one of the multiple sections of the optically transparent
8 member and a second resulting force to a second switch associated with another of the
9 multiple sections of the optically transparent member thereby causing a state change of
10 the first switch of the plurality of switches and a state change of the second switch of the
11 plurality of switches;

12 whereupon the control circuit infers:
13 a first system state if the first resulting force is greater than the second resulting
14 force; and
15 a second system state if the second resulting force is greater than the first resulting
16 force.

1 46. In a control mechanism, wherein the control mechanism has a knob, wherein the
2 knob is rotationally coupled to an optically transparent member, wherein the knob is
3 rotatable by a user and has alternating bands of reflective surface and non-reflective
4 surface, a method for accepting a user input comprising the steps of:
5 from the band of the reflective surface on the knob, reflecting the light received
6 from the optical light source to the at least one optical receiver; and
7 detecting, by the at least one optical receiver, the light reflected by the band of the
8 reflective surface on the knob.

1 47. The method of claim 46 further comprising the step of:
2 converting the detected light into a control signal.

1 48. The method of claim 47 further comprising the steps of:
2 a modulator, modulating the light directed by the light source; and
3 a demodulator, demodulating, into the control signal, the modulated light received
4 from the light source by the at least one optical receiver.

1 49. The method of claim 46 wherein the control mechanism comprises a first optical
2 receiver and a second optical receiver, further comprising the steps of:
3 when detection by the first optical receiver of light reflected from the band of
4 reflective surface is followed by detection by the second optical receiver of light reflected
5 from the band of reflective surface, identifying a knob turn in a first direction; and
6 when detection by the second optical receiver of light reflected from the band of
7 reflective surface is followed by detection by the first optical receiver of light reflected
8 from the band of reflective surface, identifying a knob turn in a second direction.

1 50. The method of claim 46 wherein a display is positioned in the area behind the
2 optically transparent member, further comprising the step of:

3 the display projecting an image for viewing through the optically transparent
4 member.

1 51. The method of claim 46 wherein the knob is constructed of transparent material
2 and wherein a display is located behind the knob, further comprising the step of:

3 the display showing an image through the knob for viewing.

1 52. The method of claim 46 further comprising the step of:

2 projecting the light transversely through the optically transparent member.

1 53. The method of claim 46 wherein the optically transparent member has an optical
2 coating, further comprising the step of the optical coating blocking transmission of
3 ambient light from an extraneous source to the at least one optical receiver over a
4 predetermined range of the electromagnetic spectrum.

1 54. The method of claim 46 wherein the optically transparent member contains a dye,
2 further comprising the step of:

3 the dye blocking transmission of ambient light from an extraneous source to the at
4 least one optical receiver over a predetermined range of the electromagnetic spectrum.

1 55. The method of claim 46 further comprising the step of:

2 transmitting a resulting force to a switch associated with a desired control
3 function, in response to a user pressing the knob;

4 wherein the resulting force is caused by the user application of a force to the
5 knob.

1 56. The method of claim 46 further comprising the step of:

2 accepting additional user input from one of a voice recognition device, a motion
3 detection device and a proximity detection device.

- 1 57. The method of claim 56 further comprising the step of:
2 changing the value of the user input based on the additional user input accepted
3 from the one of the voice recognition device, the motion detection device and the
4 proximity detection device.
- 1 58. The method of claim 57 further comprising the step of:
2 upon detecting the presence of a user's hand proximate to a proximity detector
3 coupled to the control mechanism, the control mechanism changes the information
4 content of the display.
- 1 59. The method of claim 58 wherein the control mechanism, based upon the detection
2 of the presence of the user's hand proximate to the control mechanism, changes at least
3 one menu option.
- 1 60. The method of claim 58 wherein the control mechanism, based upon the detection
2 of the presence of the user's hand proximate to the control mechanism, increases the
3 information content displayed.
- 1 61. The method of claim 58 wherein the control mechanism, based upon absence of
2 the detection of the presence of the user's hand proximate to the control mechanism,
3 decreases information content displayed.
- 1 62. The method of claim 58 wherein, in addition to sensing a signal indicating
2 proximity of the user's hand to the control mechanism, the receiver detects a signal
3 transmitted by a remote control.
- 1 63. The method of claim 62 wherein, when the signal indicating proximity of the
2 user's hand and the signal transmitted by the remote control are modulated according to
3 different modulation schemes, the receiver distinguishes between the signal indicating
4 proximity of the user's hand and the signal transmitted by the remote control by
5 identifying one of the modulation and coding of both signals.
- 1 64. A system for accepting user input, comprising:
2 a plurality of switches;

3 a pressure member coupled to the plurality of switches, the pressure member
4 having multiple sections, wherein each section of the multiple sections is associated with
5 a switch of the plurality of switches; and

6 wherein the pressure member is positioned in relation to the plurality of switches
7 such that when a force is applied by a user to one of the multiple sections, the pressure
8 member transmits a resulting force to a switch associated with the one of the multiple
9 sections thereby causing actuation of the switch associated with the one of the multiple
10 sections and wherein at least one switch of the plurality of switches is interposed between
11 the pressure member and a frame.

1 65. The system of claim 64 wherein when, in response to the exertion of pressure by
2 the user to the one of the multiple sections of the pressure member, the pressure member
3 is moved from the pressure member's neutral position, the actuator of a switch associated
4 with the one of the multiple sections causes the system to identify a switch activation
5 associated with the one of the multiple sections.

1 66. The system of claim 64 further comprising a suspension-mounted retainer that
2 moveably couples the pressure member to the frame.

1 67. The system of claim 66 wherein the suspension-mounted retainer includes a
2 compressable spacer.

1 68. In a system for accepting user input, a method for accepting the user input,
2 wherein when in response to exertion of pressure to one of multiple sections of a pressure
3 member by a user, a section of the pressure member is moved from the pressure
4 member's neutral position, an actuator of a switch associated with the one of the multiple
5 sections of the pressure member causes the system to identify a switch activation
6 associated with the one of the multiple sections of the pressure member.

1 69. A control mechanism comprising:
2 a user input area;
3 a controller; and

a proximity detector wherein the proximity detector detects the presence of a user's hand near the user input area and wherein, upon placement of the user's hand near the control mechanism, the controller is configured to change the information content of the display.

70. The control mechanism of claim 69 wherein the information content comprises a set of at least one menu option.

71. The control mechanism of claim 69 wherein the controller is configured to change the information content of a multi-media device employed in a vehicle.

72. The control mechanism of claim 69 wherein the controller is configured to, based upon detection of the presence of a user's hand proximate to the control mechanism, increase the information content displayed.

73. The control mechanism of claim 69 wherein the controller is configured to, based upon an absence of detection of the presence of a user's hand proximate to the control mechanism, decrease the information content displayed.

74. The control mechanism of claim 69 wherein the proximity sensor further comprises a transmitter and receiver and wherein, in addition to sensing a signal indicating proximity of the user's hand to the control mechanism, the receiver detects a signal transmitted by a remote control.

75. The control mechanism of claim 74 wherein, when the signal indicating proximity of the user's hand and the signal transmitted by the remote control are modulated according to different modulation schemes, the receiver distinguishes between the signal indicating proximity of the user's hand and the signal transmitted by the remote control by identifying one of the modulation and coding of both signals.

76. The control mechanism of claim 6 wherein the control mechanism operates in a motor vehicle.

- 1 77. The control mechanism of claim 7 wherein the control mechanism operates in a
2 motor vehicle.
- 1 78. The control mechanism of claim 6 wherein the control mechanism operates as the
2 control mechanism for a media player.
- 1 79. The control mechanism of claim 7 wherein the control mechanism operates as the
2 control mechanism for a media player.
- 1 80. The control mechanism of claim 6 wherein the control mechanism operates as the
2 control mechanism for a portable device.
- 1 81. The control mechanism of claim 7 wherein the control mechanism operates as the
2 control mechanism for a portable device.